PowerPractice Essentials | Lee

Part 1

1) Dimensional Analysis
2) Accuracy and Precision
3) Significant Figures
4) Isotope Notation and Percent Abundance
5) Naming Ionic Compounds I: Binary
6) Naming Molecular Compounds
7) Basic Molar Conversions

Part 2

8) Balancing Equations, basic
9) Naming Ionic Compounds II: Tertiary
10) Percent Composition
11) Types of Reactions
12) Mole Ratios, basic
13) Stoichiometry

Part 3

14) Pressure Conversions
15) Three Basic Gas Laws
16) Specific Heat Capacity ($q=mc\Delta t$)
17) Molar Heat / Phase Changes
18) Electron Configurations
19) Ideal Gas Law & Real Gas Deviation from Ideal
20) Combined Gas Law

Part 4

21) Dalton's Law of Partial Pressures; Graham's Law of Effusion
22) Reading Potential Energy Diagrams
23) Empirical Formula; Determining Molecular Formulas
24) Molarity I: Beginner
25) Molarity II: Intermediate
26) Acids and Bases I: Beginner
27) Acids and Bases II: Intermediate

Part 5

28) Nuclear Equations
29) Half Lives
30) Le'Chatelier's Principle
31) Spontaneity
32) Organic Chemistry I: Introduction
33) Organic Chemistry II: Functional Groups
34) Reduction-Oxidation

PowerPractice Essentials #1: DIMENSIONAL ANALYSIS
Chemistry | Lee

1) A football field is 120 yards long. How many centimeters is this?
(2.54 cm = 1.00 inch; 12 inches = 1 foot; 1 yard = 12 feet)

2) Billy is exactly 36 months old. Convert his age to minutes.

3) The average velocity of an N_2 molecule at a certain temperature is 430 m/s.
(1.00 mile = 5280 feet = 1.61 km)

a. Determine the speed of the molecule in kilometers per hour (km/hr)

b. Calculate the average velocity in units of feet per minute (ft/min).

c. Assuming the molecule travels without interacting with another particle, approximately how many meters would the molecule travel after 30 seconds? (1000 m = 1 km)

PowerPractice Essentials #2: ACCURACY AND PRECISION
Chemistry | Lee

Four new machines have been developed by different companies to test the concentration of a lead (Pb) in the drinking water of a city. The concentration of lead is measured in ppb (parts per billion), and high-quality lab tests have determined that the true Pb concentration is 15.4 ppb. Here is the data from the different machines from three different trials.

	WaterWiz 3000	**Safe Sip**	**ProTest ZQ**	**T-Micro Kit**
Trial 1	15.6 ppb	14.8 ppb	13.9 ppb	15.4 ppb
Trial 2	15.9 ppb	15.8 ppb	14.2 ppb	12.7 ppb
Trial 3	17.2 ppb	15.3 ppb	14.4 ppb	14.8 ppb
Mean (Average)				
Range				

1) Determine the mean and range for the concentration data that each machine provided, considering all trials.
2) Which machine is the most precise?

3) Which machine is the lease precise?

4) Which machine is most accurate?

5) Which machine is least accurate?

6) To determine *accuracy*, use the _____ of the data, and see how close it is to the true (actual) value.

7) To determine *precision*, use the _____ of the data. It will be smaller for more precise measurements.

PowerPractice Essentials #3: SIG FIGS
Chemistry | Lee

1) Density = Mass / Volume.
   The mass of a mineral is 3.565 g, and the volume is 2.8 cm^3. Determine the density of the mineral using correct sig figs.

2) A construction worker cuts a section of wood to be 9.45 feet long.
   His partner cuts another section of wood that she measured to be about 12 feet long. They glue the two sections together to create a single piece. How long is the combined section?

3) Jacob and his twin brother Jim build rectangular gardens for their landscaping business. Jacob meticulously measures the length of the garden below to be 13.25 meters long. Jim was in a hurry to get home for his son's birthday, and quickly measures the width to be about 21 meters wide.
   a. Determine the area, in m^2, of the garden. Be sure to use correct sig figs.

   b. What is the perimeter of the garden in correct sig figs?

   c. It costs \$2.50 to fertilize 10 m^2 of a garden. Calculate the approximate cost to fertilize this garden, rounded *up* to the nearest \$20.

PowerPractice Essentials #4: ISOTOPES
Chemistry | Lee

1) Determine the number of neutrons, protons, and electrons in each of the following *neutral* isotopes.

   a. Carbon-14

   b. $^{106}_{46}\text{Pd}$

   c. ^{56}V

   d. Arsenic-75

2) Write the isotope notation for the following species:
   a. An isotope with 52 neutrons and 40 protons

   b. An isotope with 58 protons and 83 neutrons

   c. An isotope with 58 protons and 81 neutrons

3) Circle the isotope that has the most neutrons: ^{56}Fe ^{54}Mn ^{56}Ni ^{58}Co

4) Rubidium is a soft, silvery-white metal that has two common isotopes, ^{85}Rb and ^{87}Rb. If the abundance of ^{85}Rb is 72.2% and the abundance of ^{87}Rb is 27.8%, what is the average atomic mass of rubidium?

5) An unknown element (symbol Uk) has the following isotopes with their relative abundances:

Uk-66	45.5%
Uk-67	33.0%
Uk-70	21.5%

   Determine the approximated weighted average atomic mass for the unknown element.

PowerPractice Essentials #5: NOMENCLATURE – BINARY IONIC
Chemistry | Lee

1) Determine the name of the following compounds:

   a. NaBr

   b. $MgCl_2$

   c. CaO

   d. K_2S

2) Determine the name of the following compounds. The cation may be a transition metal.

   a. Sr_3P_2

   b. $FeCl_3$

   c. FeS

   d. MnO_2

   e. CrN_2

   f. Ti_2Se

3) What is the formula for the following ionic compounds?

   a. Palladium(III) chloride

   b. Lithium sulfide

   c. Calcium phosphide

   d. Tin(II) oxide

   e. Lead(IV) oxide

   f. Lead(IV) fluoride

4) Write the oxidation state of the metal cation on the line:

   a. $NiBr_3$ ____

   b. TiO_2 ____

   c. TiO ____

   d. Rb_2Se ____

   e. Cu_3P_2 ____

   f. WS_3 ____

PowerPractice Essentials #6: NOMENCLATURE – MOLECULAR/COVALENT
Chemistry | Lee

1) A molecular (or covalent) compounds is made of two or more _____.

2) Provide the numerical prefix for each number:

One	Two
Three	Four
Five	Six
Seven	Eight
Nine	Ten

3) Determine the name of the compound, given the formula:
   a. N_2S
   b. CF_4
   c. P_2O_5
   d. N_2O_4
   e. SO_3
   f. $SeBr_2$
   g. P_4S_9
   h. XeF_6
   i. SiO_2
   j. OCl_2

4) Write the formula for the compound, given the name:
   a. Dinitrogen monoxide
   b. Nitrogen trihydride (commonly called *ammonia*)
   c. Trisilicon tetranitride
   d. Sulfur hexabromide
   e. Diselenium diiodide
   f. Carbon tetrachloride

PowerPractice Essentials #7: BASIC MOLAR CONVERSIONS
Chemistry | Lee

1) How many particles is one mole? Write it in scientific notation: _____
2) One dozen is 12 things.
    a. How many eggs does a farmer have if she has 7.5 dozen?

    b. How many dozen is 94 eggs?

    c. One egg costs $0.18, so how much money does 9 dozen eggs cost? Use dimensional analysis.

3) One mole is _____ particles (such as atoms, molecules, electrons, etc.)
    a. How many moles does a chemist have is he has 7.5×10^{24} atoms?

    b. How many iron atoms is 2.23 moles?

    c. How many helium atoms is 7.80 moles?

Using Molar Mass (g/mol):

4) What is the molar mass of dinitrogen monoxide (N_2O) gas?

    a. A dentist uses 5.33 mol $N_2O(g)$ one day. Determine the mass of $N_2O(g)$ used, in grams.

5) What is the molar mass of methane (CH_4) gas?

    a. A chef uses 6.40 grams of $CH_4(g)$ one day. Determine the number of moles of $CH_4(g)$ used.

6) Diamonds are pure carbon. Billy has a diamond that has a mass of 0.887 g.
   How many carbon atoms are inside his diamond?

7) A microbiologist needs 0.0224 g of ribose ($C_5H_{10}O_5$) for a cellular biology experiment.
    a. Determine how many moles of ribose this is.

    b. How many molecules of ribose is this equivalent to?